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**LINKAGES BETWEEN AGRO-INDUSTRY AND
SMALL-SCALE AGRICULTURE IN GUYANA***

* This document was prepared by Ena C. Harvey, Consultant, of the Agricultural Development Unit, Division of Production, Productivity and Management, within the framework of the project "Promotion of the economic and social integration of small and medium-scale farmers into agro-industry", under the cooperation agreement between the Economic Commission for Latin America and the Caribbean (ECLAC), the Food and Agriculture Organization of the United Nations (FAO) and the Government of Germany through the German Agency for Technical Cooperation (GTZ).

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ACRONYMS

CARDI	Caribbean Agricultural Research and Development Institute
CESO	Canadian Executive Services Overseas
CIDA	Canadian International Development Agency
ERP	Economic Recovery Programme
GAPA	Guyana Agro-Processors Association
GDP	Gross Domestic Product
GPC	Guyana Pharmaceutical Corporation
GRFHS	Guyana Rural Farm Household Survey
GRMMA	Guyana Rice Milling and Marketing Authority
GUYSUCO	Guyana Sugar Corporation
IAST	Institute of Applied Science and Technology
IICA	Inter-American Institute for Cooperation on Agriculture
IFAD	International Fund for Agricultural Development
IPED	Institute of Private Enterprise Development
LIDCO	Livestock Development Company
MOA	Ministry of Agriculture
NARI	National Agricultural Research Institute
NEOCOL	National Edible Oil Company
NGMC	New Guyana Marketing Corporation

Rate of Exchange

US\$ 1 = G\$ 126

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ABSTRACT

Agro-industry in Guyana plays an important role in linking the agricultural with the industrial sector. This report looks at linkages between agro-industry and small-scale producers as a crucial element in more efficient agriculture and improved prospects for rural development.

The salient feature of Guyana's agricultural sector is that sugar and rice together account for almost 70% of agricultural GDP. In terms of overall output, small-scale producers play only a minor part in this scenario. In addition, this sub-sector suffers from the well-known problems of traditional agriculture, including under-capitalization and low levels of mechanization.

There are a number of agro-processing activities in the country. Their efficient functioning and further development, however, are limited by constraints such as, inadequate human as well as physical infrastructure. Other impeding factors are an attitude of mistrust based on past experience on the part of many farmers and a lack of loyalty on the part of processors, who face the constant problem of ensuring steady supplies of produce that meet high standards of quality.

These complications notwithstanding, some promising forms of farmer-processor associations can be identified: i) direct purchase; ii) contract farming, especially for crops such as hot peppers, passion fruit or peanuts, and iii) vertical integration arrangements.

To promote and strengthen linkages between Guyana's small-scale agriculture and agro-industry, however, further efforts by both the public sector and private enterprise are obviously needed. As far as the Government is concerned, a clear definition of institutional responsibilities would be a good starting point. In addition, public assistance in the provision of physical infrastructure in order to make reliable transportation arrangements possible, is crucial.

Last but not least, the removal of existing legal shackles, such as the cumbersome registration requirements for food-processing operations, would contribute to a more conducive environment for the modernization of Guyanese agriculture.

I. INTRODUCTION

Agro-industry¹ links the agricultural and industrial sectors in Guyana through the supply of basic inputs from indigenous agricultural production (including sugar, rice, copra, fruits, vegetables and root crops) and the enhancement of agricultural output through downstream processing activities.

Apart from its importance in stimulating economic development, agro-industry plays a significant role in rural development in Guyana with respect to employment generation (particularly for women) and alleviation of poverty. The potential for agricultural production is high in the intermediate savannahs, as well as in the riverine and interior regions. Moreover, the current pressure for agricultural land on the narrow coastal plain has made it almost imperative to develop the rural areas. Currently, thousands of tons of produce, particularly fruits and vegetables, reportedly go to waste annually because of unreliable and expensive transportation to major trading points, and because of the lack of resources (electricity, drinking water, facilities and skills) and supportive food policies for the processing of highly perishable commodities within rural communities.

The negative effects on food distribution caused by ineffective transportation facilities can be observed in the increasing levels of malnutrition in many rural communities. Agro-processing has significant potential to improve levels of nutrition by reducing postharvest losses, by extending the shelf life and availability of perishable seasonal produce, and by providing low-cost, highly nutritious foods.

The increasing emphasis on consumption of "health" foods and on the use of natural medicines has given rise to new markets for "natural" and exotic products. The vast and unexploited forest species which exist in Guyana's interior, and the technologies currently used by the Amerindian communities and other rural groups for processing these products, have tremendous potential for agro-industrial development.

Currently, approximately 60% of all farms in Guyana are classified as "small farms". Typically, these farms are engaged in mixed farming of non-traditional commodities (fruits, vegetables and root crops). The sector accounts for a relatively small share of agricultural GDP in Guyana, primarily because of its low level of development *vis-à-vis* the "traditional" sector, which focuses on the production of rice, sugar and coconuts. While there is some level of linkage between small-farm agricultural production and the agro-processing sector, many factors limit the development of sustainable linkages.

This study looks at the linkages between agro-industries and small-scale agriculture in Guyana, with a view to determining the types of products and forms of association that have the greatest potential to enhance the levels of productivity and income of small agricultural producers.

II. APPROACH AND METHODOLOGY

The approach is based on the central hypothesis that agro-industries have the potential ability to promote sustainable rural development, generate employment, use indigenous resources, generate savings and create dynamic linkage effects, and that small producers can effectively service the needs of agro-industry through the provision of selected inputs.

The consultant visited Guyana and met with key persons in the agricultural and agro-industrial sectors. These included the major producers and processors of indigenous agricultural produce, representatives of the Guyana Agro-Processors Association (GAPA), the Inter-American Institute for Cooperation on Agriculture (IICA) and public sector institutions including the Ministry of Agriculture, the National Agricultural Research Institute (NARI) and financing agencies. Several relevant reports and published documents were also reviewed. (A list of contacts is presented in annex 2.)

A general assessment was made of the characteristics of small-farming systems in Guyana and of the main types of linkages between small-scale producers and agro-processors. The linkages were examined with respect to the following:

- the reasons for opting for a particular kind of agreement;
- the advantages, disadvantages and risks for each of the parties involved;
- the stability of the relationship;
- the impact on income and productivity of the agricultural producers involved.

III. CURRENT STATUS OF SMALL-SCALE AGRICULTURE

1. The agricultural sector

Agriculture is the largest productive sector in Guyana in terms of primary production, employment and foreign-exchange earning capacity. The sector also accounts for the largest portion of the domestic food supply. Sugar and rice production constitute the majority of economic activity in the sector. The sugar industry accounts for 60% of agricultural gross domestic product and 18% of national GDP, and it employs approximately 10% of the labour force (27,500 persons). Sugar production is undertaken by large farms of more than 100 acres which are managed by the Guyana Sugar Corporation (GUYSUCO).

Rice, Guyana's second major crop after sugar, accounted for 8.8% of agricultural GDP in 1993. In addition to meeting local consumption demands, the rice industry is a major source of income and employment in rural areas, as well as an important source of foreign exchange. The industry is currently expanding at an estimated rate of 20% per annum. Rice production is controlled by private farmers, 80% of whom are farm areas of less than 15 acres.

Crops other than rice and sugar represent an important component of the agricultural sector. When measured in 1988 prices, value added of this subsector in 1993 was G\$ 193 million or 16% of primary agricultural output. This was higher than the contribution made by rice production, which in the same year contributed 10%. The production of non-traditional crops is undertaken largely by small farmers, and to a lesser extent by some medium-sized to large companies, whose production operations are vertically integrated with agro-processing.

Most of the farming in Guyana is concentrated on the coastal plain, a narrow strip of land that is 430 km long and 15-65 km wide, in areas with major drainage and irrigation infrastructure. Farming is also practised along the river banks, particularly along the Pomeroon, Berbice, Essequibo and Demarara rivers, which are centres for the cultivation of ground provisions, coconuts, corn and some vegetables. Farming in the interior is focused primarily on livestock production, with some production of fruits, nuts and vegetables.

2. Small-scale agricultural production

The agricultural sector, like that in most of the other countries of the Caribbean Community, is characterized by a large number of small farms which coexist with the commercial, export-oriented plantation system of large farms, which are dominant from an economic standpoint. The small-farm sector accounts for a relatively small share of agricultural GDP in Guyana, primarily because of its low level of development *vis-à-vis* "large-farm" or plantation agriculture. Bank of Guyana statistics show that during the

1980s, the plantation sector, which focuses primarily on sugar, rice and coconuts, accounted for 56%-81% of agricultural GDP, while small-farm agriculture contributed 19%-44%.

In terms of farm size, the 1978 Guyana Rural Farm Household Survey (GRFHS) indicates that 60% of all farms comprise holdings of 10 acres or less. The majority of these farms are located in Regions 2, 3, 4 and 6 (namely East Berbice, East Demerara and Essequibo Coast and Islands) (see figure 1).

Small farmers produce a mixed basket of commodities which includes over forty different types of vegetables and a wide variety of fruits and root crops (see annex 1). Table 1 illustrates the geographical distribution of production for these commodities.

Table 1

**GUYANA: GEOGRAPHICAL DISTRIBUTION OF PRODUCTION OF
NON-TRADITIONAL CROPS**

Commodity	Major producing regions ^a	Specific areas within region (km from Georgetown)
Citrus	2, 3, 4	Canals Polder (40)
Banana	2, 3	Parika, Naamryk (47)
Pineapple	3, 4	Canals Polder (10)
Boulangier, cabbage	4, 5, 6	Black Bush Polder (140)
Bora	4, 5	Mahaica (42)
Cassava, eddoe, yam	1, 3, 4	Parika, Naamryk (47)
Black-eyed pea, minica	2, 4, 5, 6, 10	Black Bush Polder (140)

Source: New Guyana Marketing Corporation, *Marketing Unit Report*, June 1995.

^a Numbers in bold print indicate regions consistently producing highest volume.

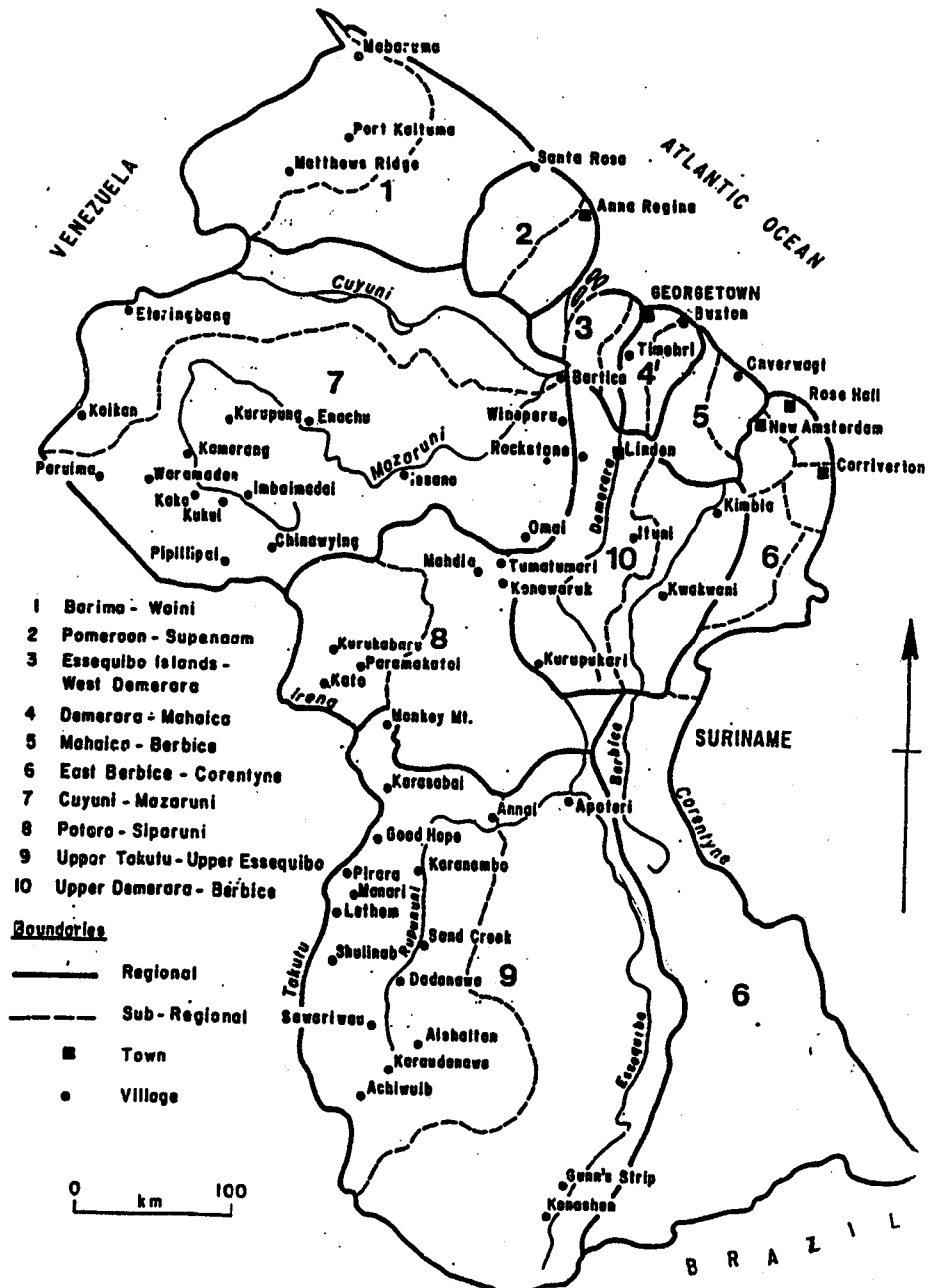
Small-scale agriculture is characterized by: private ownership; mixed farming systems, involving the production of non-traditional crops and the rearing of livestock; labour-intensive farming methods, with family members providing most of the manpower; and production for home consumption and the local fresh market.

The development of the small-farm sector *vis-à-vis* the "traditional" sector has been severely hindered by the following constraints:

- low levels of technology, including limited access to good planting material and improved cultivars;
- infrastructural deficiencies, particularly poor access roads and irrigation water management;

Figure 1

MAP OF GUYANA SHOWING ADMINISTRATIVE DIVISIONS



The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

- inadequate and unavailable transportation facilities, particularly in the riverine areas and in the interior;
- an inadequate marketing system, characterized by poor transportation from farms to marketing centres, inadequate storage facilities, limited linkages with agro-processors and a lack of market information;
- the absence of a reliable data base (covering information on acreages, cost of production, optimum production mixes, marketing margins, product flows and seasonality) to facilitate effective planning.

IV. CURRENT STATUS OF AGRO-INDUSTRY

Agro-processing in Guyana is integrally linked to primary production. In general terms, it can be classified into the following types of operations:

- a) Large-scale, mechanized, intensive operations for the processing of sugarcane, rice and coconuts to produce sugar, rum, molasses, milled rice and edible oil, which are traded on local, regional and international markets.
- b) A few medium- to large-scale, state-of-the-art operations with production geared to export markets, including the production of frozen seafood, canning of heart of palm and pineapple chunks, production of fruit-flavoured ice cream and frozen fruit juices and production of extruded snacks and breakfast flakes.
- c) Milk and meat production from large-scale and dairy beef ranches.
- d) A host of small- and medium-scale operations involved in a variety of enterprises which include the manufacture of fruit juices; syrups and cordials; jams, jellies, pickles and preserves; canned fruit; dehydrated fruits, vegetables and herbs; hot sauces; fruit-based table sauces and cassareep; root-crop meals and flours; curry powder and spices; roasted nuts; and snack foods.
- e) Small-scale and irregular processing of fruits of existing forest species, such as cashew.
- f) On-farm processing.

The large-scale agro-processing operations comprise GUYSUCO, the Guyana Rice Milling and Marketing Authority (GRMMA), the National Edible Oil Company (NEOCOL), the Maharajah Oil Company and the Livestock Development Company (LIDCO).

The small and medium-sized companies involved in agro-processing are listed in annex 2. Almost all of these operations use local agricultural produce which is sourced either through their own production or from small farmers.

1. Major constraints on development of the sector

Despite all the above processing activities, agro-industrial development remains severely limited by several factors:

- the absence of infrastructure and transportation systems which would facilitate sourcing and adequate postharvest management of raw materials located in remote areas;
- inadequate supplies of electricity and drinking water, and the absence of social amenities which would facilitate the siting and efficient operation of processing plants outside of Georgetown;
- high cost of imported raw materials, particularly packaging materials;
- irregular and unreliable supply of both raw materials and electrical power;

- inadequate technical and managerial skills in food processing;
- insufficient market information;
- lack of capital for operations and marketing, and unwillingness of banks to provide loans;
- high consumption tax of 30% on finished products;
- lack of collaboration among processors with respect to acquisition of inputs and sharing of information on technologies and markets.

The problems, as stated, point to an under-capitalized industry unable to take advantage of the abundance of raw material available or to exploit available domestic and export markets for agro-processed goods.

2. Responsibility for the sector

Several institutions and government agencies are involved in the development of the agro-industrial sector. They are:

- Ministry of Agriculture (MOA)
- National Agricultural Research Institute of Guyana (NARI)
- New Guyana Marketing Corporation (NGMC)
- Inter-American Institute for Cooperation on Agriculture (IICA)
- Caribbean Agricultural Research and Development Institute (CARDI)
- International Fund for Agricultural Development (IFAD).

The government's Economic Recovery Programme (ERP) has identified agro-industry as a key area for investment because of its potential for the export of value-added processed products and because of its impact on food self-sufficiency and the development of a diversified economy.

Initiatives are currently being undertaken to merge the NARI, the NGMC, Agricultural Extension and the private sector, in order to create a market-driven focus and to integrate the development of the agro-industrial sector.

Financing for agro-industry and for small-scale projects is handled primarily by the Institute of Private Enterprise Development (IPED) and commercial banks.

V. CASE STUDIES OF SUCCESSFUL AND UNSUCCESSFUL EXPERIENCES OF AGRO-INDUSTRY IN GUYANA

1. 1970s to present

Significant efforts were initiated in the 1970s to develop commercial agro-industry enterprises linked to domestic agricultural production. Government policies sought to reduce the food import bill and promote greater use of indigenous foods, through the imposition of import restrictions on foodstuffs such as fresh and dried fruit, salted fish, milk, cheese, margarine, wheat flour and non-indigenous cooking oil.

This programme of national self-sufficiency included product development and processing trials for a wide range of commodities including rice, root crops (yam, cassava), fruits (carambola, gooseberries, malacca, citrus, pineapple and others) and vegetables. Organizations and agencies such as the Community Development Division, the Carnegie School of Home Economics, the Guyana School of Agriculture Corporation, the Guyana Federation of Women's Institute and the Women's Revolutionary Socialist Movement conducted countrywide demonstrations and promotions to encourage housewives and entrepreneurs to use the technology developed.

Programmes were also implemented to increase food production through the Food Crop Production and Marketing Program, the establishment of the National Dairy Development program, livestock research, development of artisanal fisheries, and crop diversification by GUYSUCO. The latter included the production of legumes and sorghum, aquaculture development, milk production and butter and cheese processing.

A Food Production Unit was established at Lethem in the Rupununi Savannah, primarily to utilize existing fruit, which was being wasted, and to provide training for women of the region. The Unit produced a wide range of products from available raw commodities, including preserves, syrups, vinegar, pepper sauce, achar, cassareep, honey, farine, tapioca and peanut butter.

Several cottage industries and a national company —the Guyana Pharmaceutical Corporation (GPC)— were established to commercialize the locally developed and adapted technologies. The GPC entered into formal contractual arrangements with farmers to supply pineapples, carambola and cherries. It undertook food processing under the Quality Foods Company, which produced some 30 products including orange and pineapple juice, canned pineapple chunks, carambola products, ham, bacon, sausages, corn meal and a low-cost baby weaning food. The GPC also managed a stock feed plant, utilizing by-products from the soybean, rice and coconut oil processing industries.

The processing of carambola fruit by Quality Foods was particularly promising. The company developed a range of carambola-based products, including candied fruit, rum-flavoured candied fruit, fruitcake mince, fruit leather, soft drink concentrate, pancake syrup, ice-cream topping, a table sauce and a liqueur. These products were successfully promoted at several international food fairs. The rum-flavoured candied fruit won International Gold Medal Awards on two occasions, and the table sauce was awarded a

Gold Medal and Diploma of Excellence at the 1985 Leipzig Fair. In 1988, requests were received from the United Kingdom for some 5,000 gallons of the table sauce and 1,500 pounds of dried fruit.

Farmers were encouraged to plant some 500,000 carambola trees, and in 1988, it was estimated that about 180 metric tons of carambola fruits were supplied to the main private-sector and government-owned processing facilities. This represented a value of G\$ 46,800 or US\$ 4,680, with an estimated profit to the farmer of U\$ 0.09/kg.

All of the gains made in product development, promotion and marketing were, however, severely eroded by a number of factors. These included:

- poor post-harvest management of the fruits, which led to a high percentage of losses during trucking and river transport;
- inappropriate processing machinery and equipment and low technology standards for production, which resulted in variable finished-product quality and production inefficiencies;
- periodic shortages of sugar;
- poor product packaging and presentation;
- lack of foreign exchange for upgrading equipment and technology;
- poorly developed trading arrangements;
- institutional deficiencies.

In addition, the capacity of the processing sector to absorb the vast quantities of fruit produced by the farming sector was grossly inadequate. Strategies were never developed for forging and developing backward linkages to farmers. The frustration on the farmers' part was evidenced by reports that some farmers were destroying trees of bearing age.

Cottage industry operators experienced severe problems with the marketing of carambola juice. Competition from juices imported from Venezuela and the imposition of consumption taxes made the price of locally processed carambola juice uncompetitive. Moreover, attempts at exporting the juice to international markets met with serious difficulties. The lack of analytical testing equipment and chemicals at the Institute of Applied Science and Technology (IAST) delayed laboratory testing of samples by as much as six months. In addition, freight rates were prohibitively high, and available freight volume limited.

These frustrations were not limited to the carambola-processing operation. All of the other initiatives to develop commercial agro-industry enterprises became unsustainable in the economic climate in which they were created. The lack of foreign exchange made it impossible to purchase items such as veterinary medicines, livestock supplements, agricultural inputs, cans and other packaging materials. Equipment and machinery could not be repaired because of the inability to purchase fuel, spare parts or lubricating oils, and frequent electricity outages and lack of water eventually resulted in total stoppage of operations. These operational problems were, in turn, exacerbated by managerial and institutional deficiencies.

2. Selected experiences of linkages between agricultural production and agro-industry

The majority of agro-processing enterprises in Guyana use locally-grown agricultural produce. A few of the medium-sized companies such as Vinelli Industries, TOPCO and Adventure Manufacturing are vertically integrated, sourcing 20%-80% of their total inputs from their own estates and orchards. However, a high proportion of the raw

material, particularly that used by small enterprises, comes directly from small-farmer production.

Small farmers may sell specific volumes or an entire crop directly to processors on the basis of informal agreements. Alternatively, processors may purchase produce via middlemen or from major marketing points such as Stabroek or Bourda, as well as from wharves.

The following descriptions of selected enterprises illustrate the different types of arrangements used for sourcing produce.

Adventure Manufacturing Co. Ltd.

This company is based in Queenstown, West Bank Essequibo. It produces pineapple chunks, pineapple jam, guava jam and jelly, guava cheese and frozen carambola, guava and cherry juices. All of the West Indian cherries, 20% of the guavas, and 10% of the pineapples used are sourced from the company's plantation, which is situated at Naamryk Backdam.² The other fruits are purchased from some 100-110 small farmers from Parika, Naamryk and, to a lesser extent, Canals Polder. The fruits are either collected from the farmers or delivered to the factory.

Demerara Distillers Ltd. (DDL)

DDL is a private company which was established in 1980. Operations include the manufacture of jams, jellies and marmalade from local fruits (including West Indian cherry, passion fruit, orange and pineapple) and a carambola-based fruit "mince" used for the preparation of traditional "black cake". West Indian cherry pulp is obtained from TOPCO, a private company recently purchased by DDL. Passion fruits are purchased from farmers, and pineapples are purchased annually from farmers in the Essequibo islands. Oranges are sourced from Parika and the Pomeroon areas. Carambola is purchased from the Pomeroon area via middlemen.

Timehri Orchard Products Co. Ltd. (TOPCO)

TOPCO is a medium-sized plant which produces single-strength juices from local fruits. A small percentage of the juice is sold to DDL for the manufacture of jams and jellies. The majority is sold in plastic bags to the hotel and food-service sector. Sixty percent (60%) of fruits used are derived from the company's 35 acres of orchards. These include 15 acres of West Indian cherries and scattered acreages of citrus and hogplum. The company reportedly has no problems with sourcing of fruits since the farmers are very well known to the manager. Farmers are paid "on the spot" for their fruits.

Tropical Organic Products Ltd.

This company produces dehydrated mango, ginger, carambola, coconut and pineapple, primarily for sale on specialty and organic food markets in the United States. The company purchases fruits in season —when prices are lowest— and sometimes dumps produce on the local fresh produce market to keep prices down. The manager

typically purchases an entire crop from a farmer. Although neither the actual quantities purchased nor their prices were revealed, the fact that the factory employs 40 women on a one-shift basis indicates that the quantities used are significant. Moreover, the manager is currently negotiating expansion of production with vertical integration on two farms, one of 150 acres and the other of 1,000 acres.

Tropical Organic Products has managed to corner niches in the organic food market. It has spent the last three years implementing the organic production programme with farmers who supply produce.

BANKS DIH/TRISCO Division

TRISCO was established by BANKS DIH in 1986 in an effort to diversify the company's operations during the regime of import restrictions. The company produces extruded cereals and snack foods based on rice, cassava and plantain. In terms of linkages with small farmer production, the company purchased 205,000 lbs of broken rice in 1994, and 120,000 in the first 6 months of 1995. In 1993-1994, the company purchased 50,000 pounds of plantains.

Vinelli Industries Ltd.

Vinelli Industries, which was established in 1981, is recognized as a pioneer in the development of backward linkages with indigenous agricultural production. The majority of agricultural produce comes from the company's Letter "T" estate on the East Coast of Demerara, where passion fruit, melon, pepper, coconut, thyme and rice are cultivated on some 3,000 acres of land. Up to 3 tons per year of West Indian cherries are purchased from local farmers.

The company's product range includes fruit-based popsicles and guava- and pineapple-flavoured ice cream made from local milk and fruit pulps. The company recently launched a line of seasoned extruded snacks based on rice starch. It is further expanding its mix to include a wide range of natural fruit jams and jellies, which will be available in portion packs for the hotel and food-service industries.

The main types of linkages are now examined with respect to the following concerns:

- the reasons for opting for a particular kind of agreement;
- the advantages, disadvantages and risks for each of the parties involved;
- the stability of the relationship;
- the impact on income and productivity of the agricultural producers involved.

a) Reasons for types of agreements

Almost all of the agro-processors have indicated that they see immense potential for linkages with local agricultural production. However, they have experienced serious constraints with respect to distance of major production areas from Georgetown, infrastructural limitations to accessing raw materials, reluctance of farmers to enter into contractual production for fruit crops, competition with fresh market prices, seasonality of produce and quality of local material. Adventure Manufacturing stated that farmers were disillusioned and reluctant to enter into contract

production because of previous bad experiences with carambola and West Indian cherry processing.

Many processors further indicated that while contractual arrangements would be desirable in terms of regularizing supplies and standardizing specifications, they did not have the technical or financial resources to support such arrangements.

In the case of small-scale processors, procurement agreements rarely exist. Cash flow limitations and the seasonal nature of production force these operators to purchase small quantities of agricultural raw materials at infrequent intervals from various farmers or from the main markets. Moreover, small-scale processors often do not have adequate storage facilities, particularly cool storage, to take advantage of low prices when the produce is in season, and limited manpower resources constrain their ability to convert this perishable raw material into a more stable semi-processed form with a longer shelf life.

Tropical Organic Produce has overcome the problem of storing large quantities of produce by converting reefer containers into cool storage rooms. This allows the company to purchase a farmer's entire crop at low prices when the fruit is in season, and to have adequate quantities for processing.

b) *Advantages, disadvantages and risks involved*

Price

Competition with the fresh-fruit market was cited as a serious constraint by many processors. Prices of fruits vary considerably with seasonality, and are primarily determined on the basis of the fresh-market prices. For example, oranges cost G\$ 6/unit when the crop is in season, and G\$ 25/unit out of season.

This situation is not unique to Guyana. Farm-gate prices of commodities often bear no functional relationship to production costs, and farmers are often unaware of and/or uninterested in their actual production costs.

The disadvantage to the processor purchasing at these prices is the inability to recover processing costs and still remain competitive, particularly on the international market. In the food-processing industry, maximum revenue is gained on volume and repeat sales rather than on high profit margins on individual items; even a small increase in any factor of production (be it raw material, packaging or labour) can alter the final price of the finished product to the extent that the product becomes uncompetitive. A case in point is the purchase of cassava from small farmers by TRISCO. Price is a major constraint to the production process, and cassava is purchased only when the farm-gate price is compatible with the company's costings. Whereas in 1986 cassava cost 5-8 cents per lb, in 1995 the cost was G\$ 12-15 per lb, so making the price of cassava flour G\$ 75 per lb (compared to G\$ 27 per lb for wheaten flour). In addition, farmers seek out fresh-market prices for cassava, often selling the crop at the cokers to boats from Trinidad and Tobago and Barbados.

The small farmer, on the other hand, generally has a speculative, short-term view and seeks to minimize risk, while maximizing the return from small volumes of a specific crop, since farm income tends to be seasonal. Thus, while informal arrangements give no guarantee of a market, they allow the farmer freedom to dispose of the produce in an alternative market where prices are usually more attractive.

Quality and reliability of supply

The production systems employed by small-scale agricultural producers typically involve random and irregular plantings of a variety of crops. In the case of fruit crops in particular, farmers generally spend very few resources (time or money) on management of the trees, and yields tend to be variable with respect to both quantity and fruit quality. In addition, the current emphasis on the rice industry has made it very attractive for small farmers to shift into the more lucrative rice production, allocating lands previously under non-traditional crops or livestock production to rice farming, and making the availability of fruits even more limited to the processing sector.

Adventure Manufacturing indicated that seasonality of pineapple production was a problem, that the areas where pineapple is currently grown are very far inland, and that these areas are subject to flooding during the rainy season and to spontaneous combustion during the dry season. Agronomic constraints in pineapple production were also noted by Tropical Organic Produce, which has problems with postharvest development of internal brown spot. Tropical Organic Produce also cited the short mango season (three months for Buxton Spice) as a serious constraint, since current export market demand for the dried product was far beyond what Guyana currently supplies.

The procurement of produce of varying quality and from more than one source gives rise to a number of problems for the processing facility. These include disruptions in production planning; unpredictable conversion yields and variable output projections; significant levels of variation in product quality, particularly with respect to colour, consistency, acidity and sweetness levels; and, ultimately, production throughput and productivity of the processing enterprise. A case in point is the situation with rice varieties used for processing at TRISCO. TRISCO identified the variety of rice which was best suited (in terms of the quantity and quality of starch) for the production of its cereals and snacks. It is almost impossible to obtain local broken rice of the required variety, however, because all of the varieties are mixed at the mills. Moreover, the quality of the broken rice on the local market has been described as atrocious. Broken rice is not available on world markets as a traded commodity.

Another difficulty in sourcing raw materials is inaccessibility. Produce originating in the Pomeroon, for example, has to be transported by boat to Charity, from where it is trucked to Adventure and then to the Essequibo river. There is only one boat trip per day, and no cool storage facilities are available. If the boat is missed, the produce spoils and has to be dumped.

c) Stability of relationship

Current relationships between agricultural producers and existing processors are somewhat tenuous. Farmers produce primarily for the fresh market and tend to use processors for disposing of surpluses. Many farmers adopt a "wait and see" attitude before committing themselves to contracted fruit production for a processor. Those who already have established orchards generally sell their produce at the highest price obtainable, using the agro-processor as a buyer of the last resort.

In the face of high prices and irregular supplies of variable quality, the processors' loyalty and commitment to sourcing from farmers is severely diminished. Some of the larger processors have already established their own orchards, but they are in dire need of assistance with crop agronomy, orchard management and labour for harvesting. The current pressure for agricultural land on the coastal plain further complicates the situation.

Those processors who wish to acquire land for agricultural production must look towards the intermediate savannahs and the interior, which require substantial investment in infrastructural development.

d) *Impact on income and productivity of agricultural producers*

Table 2 is taken from the IICA survey of fruit processors. It shows the level of raw material used by selected fruit processing companies for 1992 and 1993 and the associated value of the produce. In 1993, the sector used 1.3 million kg of fruits estimated at approximately G\$ 4 million (excluding heart of palm).

In the case of the small-scale processors (Juice Power, Vauldina and Supreme), the collective impact on the farmers' income and productivity is significant —a total of 27,000 kg in 1992 with a value estimated at G\$ 2.3 million, or approximately 50% of the total reported in table 2.

Table 3 provides data on the level of linkage between Adventure Manufacturing and the small-farm sector in 1994-1995.

In the case of DDL, purchases for 1994-1995 are estimated at G\$ 2.5 million per year, broken down as follows:

Carambola (62,000 kg/yr)	G\$ 750,000
Orange (66,000 units)	520,000
Pineapple (12,000 units)	500,000
West Indian cherry (33,000 kg/season)	284,000
Passion fruit (7,000 kg/yr)	466,000

In 1995, TOPCO spent over G\$ 500,000 in purchases of oranges, pineapples, guavas, carambolas and grapefruits from small farmers. Prices are as follows:

Pineapple	G\$ 18-20 per pound
Orange	10 each
Guava	10 per pound
Cherry	25 per pound
Plum	25 per pound
Carambola	10 per pound
Mango	8 each

As the above demonstrates, the impact on the income of the small farmer is quite significant. While it is difficult to quantify the impact on the farmers' productivity at this time, it would be reasonable to assume that the possibility of a ready income from sales to the processing sector would encourage the farmers to allocate more resources to the management and care of their fruit trees and to increase efficiency and output through better management of their production operations.

3. On-farm agro-processing

The processing of agricultural produce at the farm level consists mainly of production of cassava bread, cassareep, copra, dried coffee beans, spices and preserved fruits (including carambola, tamarind, guava, pineapple, cherry, mango and passion fruit) for household use. A recent survey (Rutherford-Rodrigues, 1994) of rural women food producers in Guyana highlighted a range of products produced by women at the farm level. These are listed in annex 3.

Table 2
GUYANA: USE OF FRUITS BY SELECTED AGRO-PROCESSORS, 1994

FIRM	RAW MATERIAL									
	Banana		Cherry		Plum		Guava		Passion fruit	
	1992	1993	1992	1993	1992	1993	1992	1993	1992	1993
Juice Power	496	-	6,387	-	7,991	-	4,077	-	975	-
Vinelli Industries Ltd.	-	3,600	-	1,800	-	-	-	1,800	-	4,500
Amazon Caribbean (Guyana) Ltd.	-	-	-	-	-	-	-	-	-	-
Supreme Enterprise	-	-	-	-	-	-	-	-	-	-
Vauldina	-	-	-	-	-	-	-	-	-	-
Adventure Mfg. Co. Ltd.	-	-	-	-	-	-	-	-	-	-
Three Counties Foods Ltd.	-	-	-	-	-	-	-	-	-	-
TOTAL	496	3,600	6,387	1,800	7,991	-	4,077	1,800	975	4,500
Average cost (G\$/kg)	46		68		248		21		120	

Table 2 (concl.)

FIRM	RAW MATERIAL									
	Tamarind		Coconut		Heart of palm		Carambola		Pineapple	
	1992	1993	1992	1993	1992	1993	1992	1993	1992	1993
Juice Power	-	-	-	-	-	-	-	-	-	-
Vinelli Industries Ltd.	-	7,350	-	60,000 (nos.)	-	-	-	-	-	-
Amazon Caribbean (Guyana) Ltd.					780,000	1.1m				
Supreme Enterprise	-	-	-	-	-	-	400	280	-	-
Vauldina	-	-	-	-	-	-	6,750	1,800	-	-
Adventure Mfg. Co. Ltd.	-	-	-	-	-	-	68,000	35,000	145,000	67,000
Three Counties Foods Ltd.	-	-	-	-	-	-	32,063	86,755	-	-
TOTAL	-	7,350	-	60,000 (nos.)	780,000	1.1 m	107,213	123,835	145,000	67,000
Average cost (G\$/kg)	10		14 (ea)		-		12		19	

Source: M.S.A. Faroze (1994), *Study of the Fruit Processing Industry in Guyana*, Inter-American Institute for Cooperation on Agriculture (IICA).

Table 3

PURCHASES OF FRUITS BY ADVENTURE MANUFACTURING, 1994-1995

Crop	Quantity purchased (kg)	Price (G\$/kg)	Total purchases (G\$)
Guava	55,000	2.50	137,500
Pineapple	34,000	5.70	193,800
Carambola	55,000	1.10	60,500

Source: Elaborated by the author on the basis of information given by Adventure Manufacturing.

The production of cassareep occurs primarily in the Pomeroon area. Cassava roots are either grown by the farmer or purchased from neighbouring farmers. Roots are grated using simple tools, and the wet pulp is dried by the traditional method of extraction with the matapee.³ The cassareep is bottled and sold in markets and supermarkets in Georgetown.

Some families process pineapples in the Soesdyke/Linden area. Fruits are harvested, washed in the creek, peeled and grated using simple tools. The juice and pulp are separated using a matapee. The pulp is then cooked with sugar and spices in a 'karahi' (pot) on a wood-fired stove, and the mixture is poured hot into buckets for sale on the following day. The buckets of pineapple jam are sold at an average of G\$ 330/kg to bars and pastry shops in Georgetown.

A few individuals also produce fresh pineapple juice, which they sell to restaurants and hotels. Small operations typically use 20 kg of fruit per day; larger units use up to 100 kg per day. Raw materials are usually purchased at the closest market or directly at the farms, and the final products are sold within a day.

a) *Advantages, disadvantages and risks involved*

The most significant advantage of on-farm processing is the utilization of thousands of tons of fruits and vegetables which would otherwise be wasted. The processed foods could make a significant impact on the nutritional status of rural farm families. The direct involvement of the farmer and/or the farm family in agro-processing also means diversification of the product mix, employment and increased income.

In terms of marketing, the farmer has the advantage of more direct access to the final consumer in the tourism and food-distribution sectors. A greater percentage of the sales profits are consequently returned directly to the farmer.

The major obstacle to the development of agro-processing at the farm level is the lack of appropriate and supportive policies for the establishment of legally approved enterprises at the farm level. The cost for erecting facilities which would comply with current regulations is prohibitive, and the arrangements for registration, monitoring and supervision of such operations are inadequate.

The production of solar-dehydrated products provides a good example. Mr. Fedna Stoll of Organic Juice Products has successfully used simple solar dehydrators, without additives or preservatives to dehydrate over 100 local products, including fruits, vegetables, root crops, spices and fish. The technology is easily replicated at the rural level, and it is entirely appropriate to outlying areas where there is no electrical power or drinking water. However, current policies do not support the commercial production of solar-dried products at the farm or household level.

The potential impact of the utilization of such technologies by small farmers and rural farm families cannot be overstated. There are even implications for the provision of food by Guyana for many impoverished third-world countries, and for the use of excess bananas in the Windward Islands. There is also potential for linkages into eco-tourism projects, where these processing technologies can be showcased and processed items sold within an appropriate cultural setting.

b) *Stability of relationship*

The production/processing arrangement at the farm level tends to be a relatively stable one because of the integration of production, processing and marketing operations. The farmer owns and processes the produce, and also sells the finished products.

The demand for finished agro-processed products largely comes from within the rural community itself. However, the low incomes and purchasing power of those who live and work in the community make this an inadequate base for growth of on-farm agro-processing micro-enterprises.

c) *Impact on income and productivity of agricultural producers*

The impact of on-farm processing on the income of the farmer would be totally positive. The sale of processed products creates another avenue for earning income, providing a source of financing for both agricultural and non-agricultural pursuits.

VI. FORMS OF ASSOCIATION WITH GREATEST POTENTIAL

The following sections present the forms of association which will have the greatest potential on the income and productivity of the small farmer.

1. Direct purchase

The success of direct purchase depends on the level of trust that the individual small farmer and processor develop over time. Some medium-large companies have long-standing relationships with farmers who supply them directly. In many cases, these farmers do not wait to be contacted, but arrive at the processors' facilities, knowing that they will receive cash payment 'on the spot' for acceptable produce. Many of the small-scale processors also have their 'regulars' who supply them with produce, and they reportedly have no problems with their arrangements.

2. Contract farming

Small-scale producers and existing agro-processors can develop successful linkages through the establishment of contractual arrangements, particularly for short-term "cash" crops from which farmers can realize quick returns. Such crops would include: hot peppers, herbs and seasonings, passion fruit, pineapple, peas and beans, peanuts, ginger and cassava.

Tree crops have a long gestation period before generating returns. Contractual arrangements for the establishment of these crops would need to be supported on the processors' side by the provision of planting material, crop production inputs and technical advice on production, as well as crop supervision. The processor would need to select farmers carefully, particularly with respect to location, farmer's capability, level of crop management practised, size of areas available for contract production, and existing infrastructure for proper handling and transport of the crop.

3. Utilization of existing sources of produce

Processors and small-scale operators can also make contractual arrangements for harvesting, collection and transportation of commodities such as mango, hogplum and cashew⁴ which grow "wild" in Guyana. In addition, arrangements can be made with the GRMMA for the purchase of broken rice, which can be processed into starch, breakfast cereals, snack foods and livestock feeds.

4. Vertical integration

Vertical integration, either by way of cooperative production and/or processing, or on-farm processing, represents one of the best options for linking primary production and processing. Semi-processed products can be provided to existing processors for further downstream processing. Commodities such as brined peppers, single-strength fruit juices, fruit pulps and purees, solar-dried fruits, vegetables and root crops, candied fruits and dried herbs can be processed on the farm using relatively simple technologies to produce high-quality end products.

The developing eco-tourism sector provides an opportunity to showcase indigenous agro-processing technologies that are culturally important and environmentally friendly, such as the processing of cassava to produce cassareep and bread. Tourist sites within rural communities could illustrate the production and processing of these commodities and offer fresh and finished products, with accompanying genuine handicraft items for sale.

VII. ELEMENTS FOR SUCCESSFUL LINKAGE DEVELOPMENT

The development of effective and sustainable linkages between small producers, agro-industry and tourism calls for an intersectoral approach, involving the rural communities, the Ministry of Agriculture, the Ministry of Trade and Tourism, other national support institutions, non-governmental organizations (NGOs), and the private sector.

At present, there is no clear policy for agro-industrial development. The Ministry of Agriculture has no clear mandate, and the Ministry of Trade and Tourism (under which the industry nominally falls) has no specific programme in this regard. The recent initiative to merge NARI, NGMC and the private sector is a welcome development. It is hoped that this merger will lead to the development of a programme for agro-industrial development that does not marginalize the small-farm sector, but involves farmers in opportunities which can have a significant impact on their income and productivity.

The provision of infrastructure (particularly irrigation) and reliable transportation facilities should be central to the development of the small-farm subsector. Research and development would also be needed on specific agronomic problems in pineapple, passion fruit, cassava and West Indian cherry production.

With respect to the legislative framework, existing laws governing the establishment of cottage industries, particularly in outlying areas, is currently viewed by many as insensitive to the financial capacity of small operators and to the reality of living conditions within the rural communities. The process for registration of a food-processing operation and for the monitoring and supervision of food-processing facilities is also inadequate. These concerns need to be addressed seriously if agro-processing is to have an impact on the quality of life in rural communities.

1. Project proposal for on-farm processing of solar-dehydrated products

Definition of problem/justification:

- It is estimated that thousands of tons of fruits, vegetables and root crops go to waste annually because of lack of markets, costly transportation from interior regions to major markets in Georgetown, and inadequate resources for processing perishables at the source of production.
- Most of the areas where these crops are produced lack electricity and drinking water.
- Levels of poverty and unemployment are high in rural areas, and nutritional status of rural farm families is compromised by poor food-distribution systems.

- A Guyanese food processor has undertaken significant research and development on the solar dehydration of over 100 foods in Guyana. The quality of the dried products is exceptional. Colour and flavour retention are excellent, the products contain no artificial additives or preservatives, and they are easily reconstituted with the addition of water.
- The solar-dehydration technology is easily replicable, and it is appropriate for implementation in the rural areas where electricity and water supplies are inadequate.
- Small farmers and their families can be trained to dehydrate the commodities for safe transportation to Georgetown, where they can be finished to an equilibrium moisture content and checked for quality.
- Current problems of unreliable, costly and lengthy transportation of highly perishable, raw agricultural produce would be eliminated, since dehydrated products are lighter and more stable (less perishable).

Specific objectives:

- To create linkages between small-farmer production and agro-industry through the promotion of solar-dehydration technology.
- To build at least two solar dehydrators, using the technology developed by Fedna Stoll, in selected areas (possibly including the Pomeroon).
- To train selected individuals in the techniques of harvesting, postharvest handling, pre-processing and dehydration of available fruits, vegetables and root crops.
- To compile technical and socio-economic data to determine the impact of the project on the rural community.

Expected outputs:

- Employment and income generation for rural farm families.
- Utilization of agricultural produce which would otherwise have been wasted.
- Positive spill-over effects on the national economy in terms of reduction of poverty, diversification of industry, decentralization of agro-processing away from Georgetown, empowerment of rural communities, opening up of the interior, improved nutritional levels, reduction in food imports and stimulation of agricultural production.

Activities to be executed:

- Promotion of the project idea to the rural communities through a process of consultation and information dissemination.
- Identification of sites for location of solar dehydrators and selection of farmers with the capability, interest and commitment to the project.
- Construction and commissioning of dehydrators.
- Training of identified persons in the harvesting, handling and dehydration techniques.
- Pilot trials.

Possible implementing/support organizations or agencies:

Food and Agriculture Organization of the United Nations (FAO)
Inter-American Development Bank (IDB)
Ministry of Agriculture (Guyana)
United Nations Development Programme (UNDP) (Global Environment Facility).

Notes

¹ There are various definitions of the term "agro-industry". The concept generally encompasses all activities that involve the production and processing of agricultural, forestry and fisheries goods. As such, agro-industries include the preparation or manufacture of food products, beverages, textiles, wearing apparel, leather and fur products, footwear, wood products, and furniture and fixtures excluding metal.

² At present the Company has 650-700 acres available for cultivation. The lands are not fully utilized, and 75 acres of crops are currently available.

³ The matapee is a woven cylindrical hanging basket traditionally used by Amerindians and Africans for the extraction of liquid from wet grated cassava. The basket is filled with the pulp to be dried, and a weight is placed at the base (normally a log through a base loop). The longitudinal force causes the basket to constrict, so squeezing the pulp. The liquid is forced through the basket and is collected in a container placed under the basket. This cassava juice is boiled with spices and other ingredients to make cassareep.

⁴ It is estimated (Ramsammy, 1995) that at least 210 ha of cashew trees are equally distributed between the Soesdyke/Linden Highway and the Rupununi Savannah. The potential for the production of roasted cashew nuts, as well as for production of juices and preserves from the cashew apple, has not gone unnoticed. Recently, the National Agricultural Research Institute (NARI), the Ministry of Agriculture and IICA initiated collaboration on the pre-selection of outstanding local trees in the Rupununi and on the propagation of some of the large-sized nuts collected. The IICA Regional Fruit Project is also providing support to processors of cashew nuts in improving traditional processing technology. Information from several sources has been obtained and disseminated, a steam pre-conditioner has been fabricated locally, and a prototype shelling device has been obtained from Brazil.

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Annex 1

GUYANA: PRODUCTION OF "OTHER CROPS", 1993

Commodity	Production regions	Total production (Tons)	Region # producing more than 25%
Corn	1-10	3 486	10
Blackeye	1-10	468	10
Minica	1-9	192.1	6
Other legumes	1-5, 7-10	264.4	10
Peanut	1-10	1 991.6	10
Coconut	106 & 10	63	2
Cassava	1-10	30 136	1 & 8
Plantain	1-10	13 205	3
Ground provision	1-10	13 507	-
Banana	2,3,4,5,6,8,9	13 625	-
Citrus	1-6	1 166	1 & 3
Pineapple	2,3,4,6	9 465	3
Avocado	1-4	750.7	2 & 3
Carambola	3 & 4	2 870.7	2
Watermelon	3-6	2 990.9	5 & 6
Other fruit	1-5, 7	1 936.9	4
Tomato	3-6	1 885	6
Cabbage	3-6	1 730.9	6
Pumpkin	2-7	3 737.6	3 & 6
Bora	3-7	3 008.5	3 & 6
Ochro	4-7	2 323.6	6
Boulanger	3-7	2 752.2	3 & 6
Other vegetables	1-9	3 258.4	5
Eschallot	3-6	962.8	5
Hot pepper	3-6	2 026.4	6
Ginger	1 & 3	635	1
Turmeric	1	567	1
Other spices	3-5	31.5	3
Coffee beans	1-3	1 066	1,2 & 3
Cocoa	1-3	52.5	1 & 3
Orange	2,3,5 & 6	4 656.2	3
Grapefruit	2,3,5 & 6	497.4	2 & 3
Tangerine	6	-	-
Lime	2,3,5 & 6	1 324.6	3 & 6
Eddoes	1-6, & 8	8 771	3

Source: Guyana, Ministry of Agriculture.

Annex 2

AGRO-INDUSTRIAL COMPANIES USING INDIGENOUS RAW MATERIALS, GUYANA

Adventure Manufacturing Co. Ltd.

Products: Pineapple jam, pineapple chunks, guava puree, carambola juice

Alberta Jack-Samuels

Products: Cassava bread, starch, cassareep

Amazon Caribbean (Guyana) Ltd.

Products: Canned heart of palm

Arrowhead Enterprises

Products: Tomato ketchup, mustard, sauces, cordials

Banks DIH Ltd.

Products: Beverages, snack foods, cereals

BEV Enterprises Ltd.

Products: Peeled and graded shrimp, fish

BS&K Manufacturing Co.

Products: Guava jam, guava cheese, guava jelly

Caledonia Canning Co. Ltd.

Products: Macaroni

Chin's Manufacturing Industries Ltd.

Products: Food seasoning, snack foods

Continental Industries Ltd.

Products: Confectionery

Cottage Products

Products: Guava cheese, guava jam, guava jelly

Demerara Distillers Ltd.

Products: Preserved fruit, jams, jellies

Family D'Lite Foods

Products: Preserved carambola, fruit juices

Guyana School of Agriculture (GSA)

Products: Preserved carambola

GUYTRI Food Processors

Products: Pineapple chunks

Juice Power
Products: Fruit juices

Lee, Claude
Products: Fruit juices

Organic Juice Products Ltd.
Products: Fruit juices, dried fruits and vegetables

Ricks & Sari Industries Ltd.
Products: Spices, curry powder, meat & fish seasoning, tomato ketchup

Squirrel Manufacturing Industries Ltd.
Products: Jams, jellies, marmelade

Supreme Enterprise
Products: Preserved carambola

Swiss Foods
Products: Jams, jellies, fruit juices

Tandy's Manufacturing Enterprise
Products: Jams, jellies

Timehri Orchard Products Co. Ltd.
Products: Fruit juices, fruit pulps

TOPCO
Products: Fruit juices, fruit pulps

Tropical Orange Juice
Products: Orange juice

Ulrica Farms Food Processing Co. Ltd.
Products: Fruit juices

Vauldina
Products: Preserved carambola

Vinelli Industries Ltd.
Products: Ice cream, juices, bakery products, pasta noodles, preserved fruits, jams, jellies, pepper sauce, dried thyme.

Annex 3

PROCESSED PRODUCTS PRODUCED AT FARM LEVEL

CROP	PRODUCT
Carambola	Dried carambola, juice
Guava	Jam, jellies, cheese
Papaw	Candied papaw, puree
Tamarind	Shelled tamarind, syrup
Bilimbi	Hot sauce, pickles
Nuts	Salted, parched
Coconut	Oil, copra, brooms
Mango	Achar, syrup
Ginger	Dried ginger
Coffee	Dried beans
Pepper	Sauces, dried pepper
Pigeon pea	Dried peas
Black-eyed pea	Dried peas
Cassava	Bread, cassareep, starch
Plantain	Chips, flour
Fish	Salted and dried fish
Shrimp	Dried shrimp
Tumeric	Dried roots

Source: Beverly Rutherford-Rodrigues (1994), "Rural Women Food Producers in Guyana. Technology and Marketing", document prepared for the IICA/IDB Program for the analysis of agricultural policies *vis-à-vis* women food producers in the Andean Region, Southern Cone and the Caribbean.